Intelligent Data Understanding for Architecture Analysis of Entry, Descent, and Landing

Completed Technology Project (2018 - 2021)

Project Introduction

Because Entry, Descent and Landing (EDL) system validations are limited in Earth environments, these technologies rely heavily on models and analysis tools to evaluate system performance and capture uncertainties, which determine the success of a mission. The proposed research seeks to develop technologies that will provide top-level analysis capabilities for Entry, Descent, and Landing Architecture Analysis. The goal of this research is to advance the state of the art for offline Intelligent Data Understanding (IDU) technologies by incorporating an intelligent assistant that helps identify and analyze a complex data set and mine for interesting features and insight. These goals will be achieved by using adaptive operator selection algorithms to solve hard computational problems. This goal will also be met by exploring the explanation abilities of intelligent agents through visual and verbal interactions and provide critique. Secondly, this research will make use of machine learning techniques to incorporate knowledge into objective functions. These algorithms will be validated on a set of missions such as human landings on Mars and Europa. For each case study, extensive simulations will be run and sensitivity analysis and data mining will be performed to identify sensible factors that affect dependent variables during EDL. Nevertheless, the proposed research will develop the next generation of IDU technologies and will develop capabilities for high-fidelity architecture analysis to evaluate EDL choices. This technology will address NASA's challenges for developing effective computational mechanisms to identify high value data, analyze, and communicate critical issues regarding the mission. Furthermore, these technologies could also be adapted to other aspects of a mission such as mixed-initiative landing of human spacecraft, mixed-initiative exploration of planetary bodies, and multi-spacecraft collaborative on-board event detection.

Anticipated Benefits

The proposed research will develop the next generation of Intelligent Data Understanding (IDU) technologies and will develop capabilities for high-fidelity architecture analysis to evaluate EDL choices. This technology will address NASA's challenges for developing effective computational mechanisms to identify high value data, analyze, and communicate critical issues regarding the mission. Furthermore, these technologies could also be adapted to other aspects of a mission such as mixed-initiative landing of human spacecraft, mixed-initiative exploration of planetary bodies, and multi-spacecraft collaborative on-board event detection.

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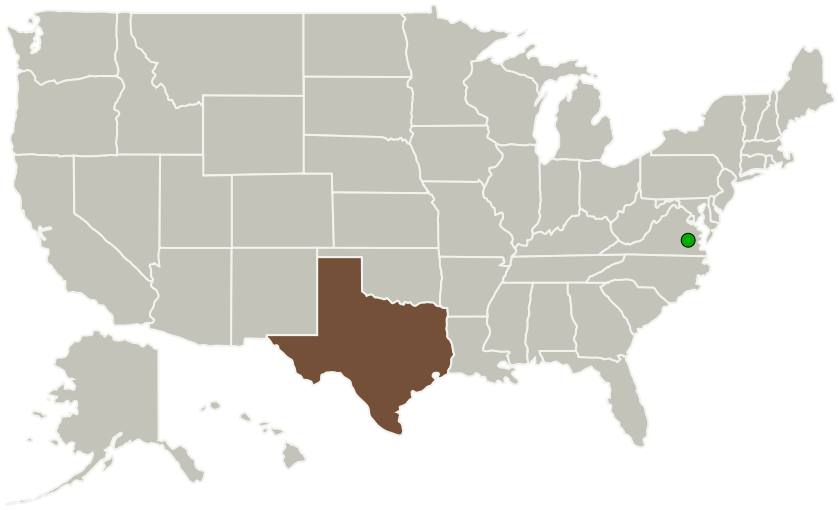
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Texas A & M University-College Station(Texas A&M)	Lead Organization	Academia	College Station, Texas
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Texas

Project Website:

https://www.nasa.gov/strg#.VQb6T0jJzyE

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Texas A & M University-College Station (Texas A&M)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Daniel Selva

Co-Investigator:

Samalis Santini De Leon

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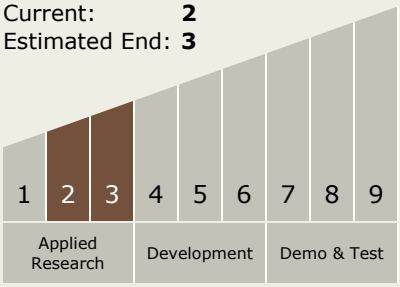
Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.1 Architecture Design and Analysis

Target Destination

Earth